Figure 1: Various synthetic pathways for the biosynthesis of DHA (docosahexaenoic acid)

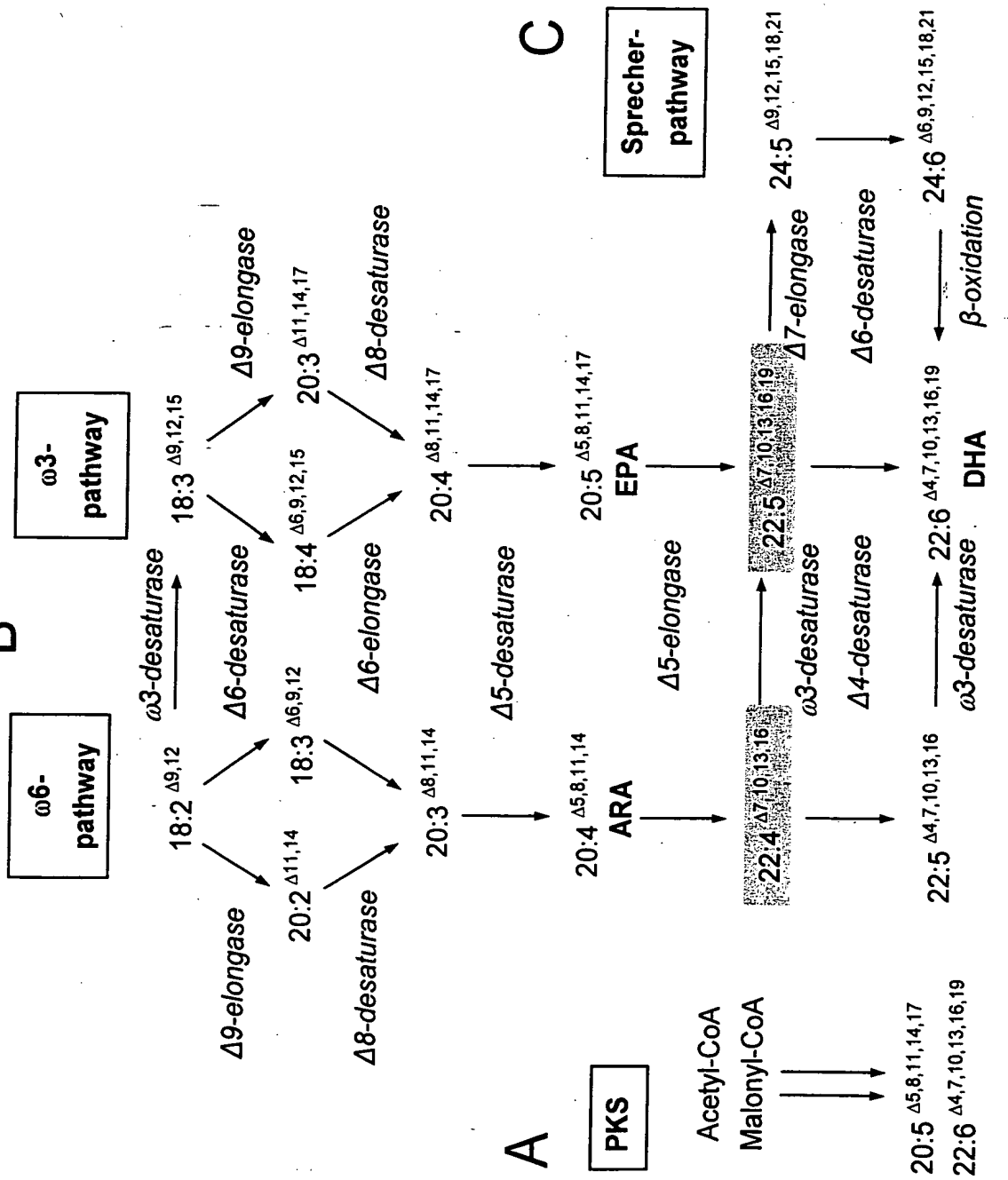


Figure 2: Substrate specificity of the Δ5-elongase (SEQ ID NO: 53) for various fatty acids

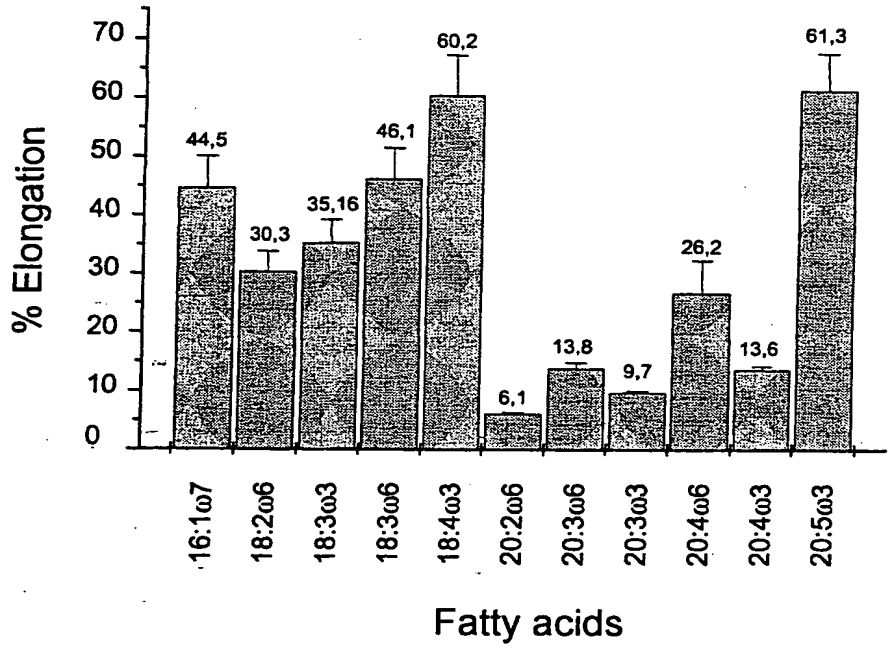


Figure 3: Reconstitution of DHA biosynthesis in yeast starting from 20:5ω3.

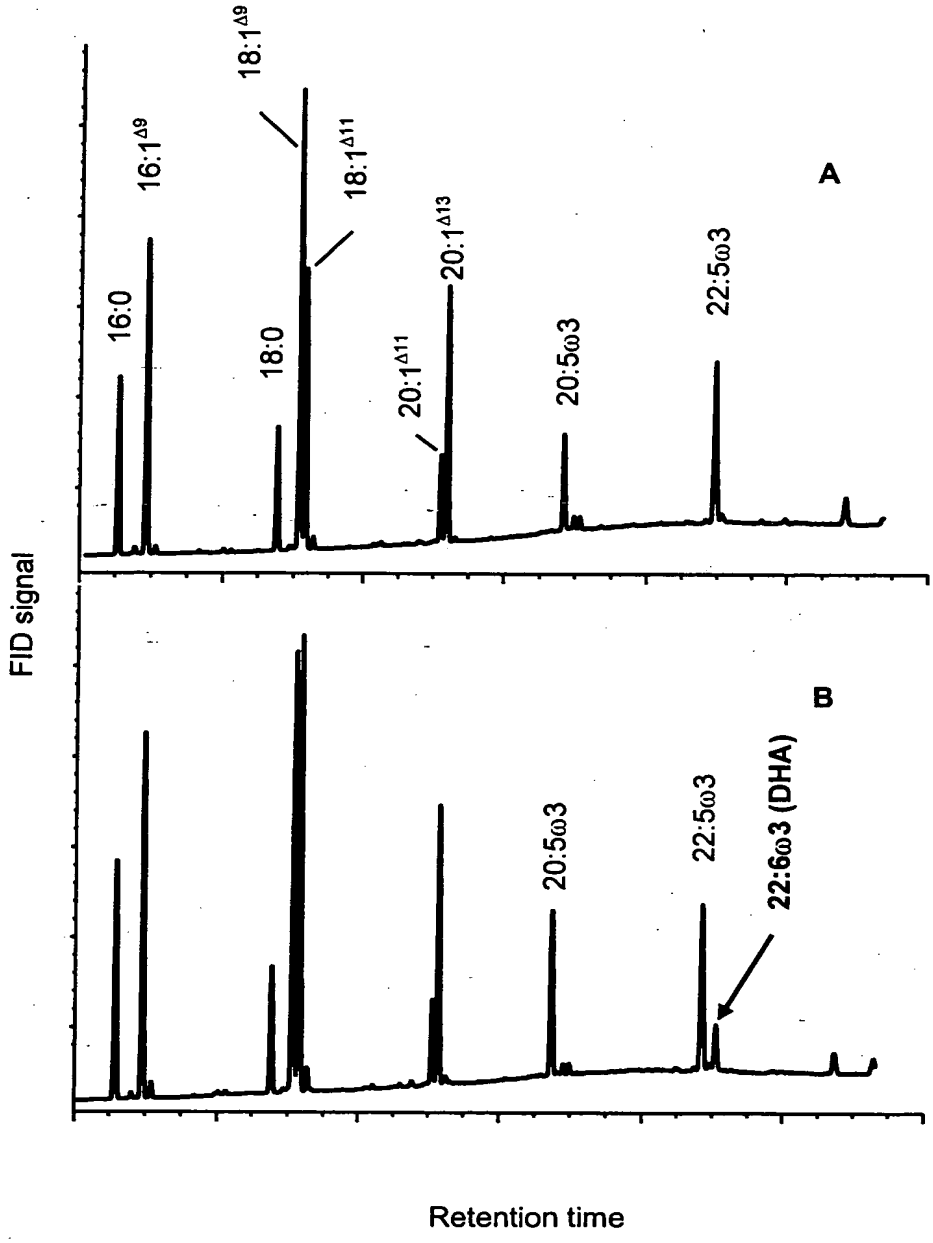


Figure 4: Reconstitution of DHA biosynthesis in yeast starting from 18:4ω3.

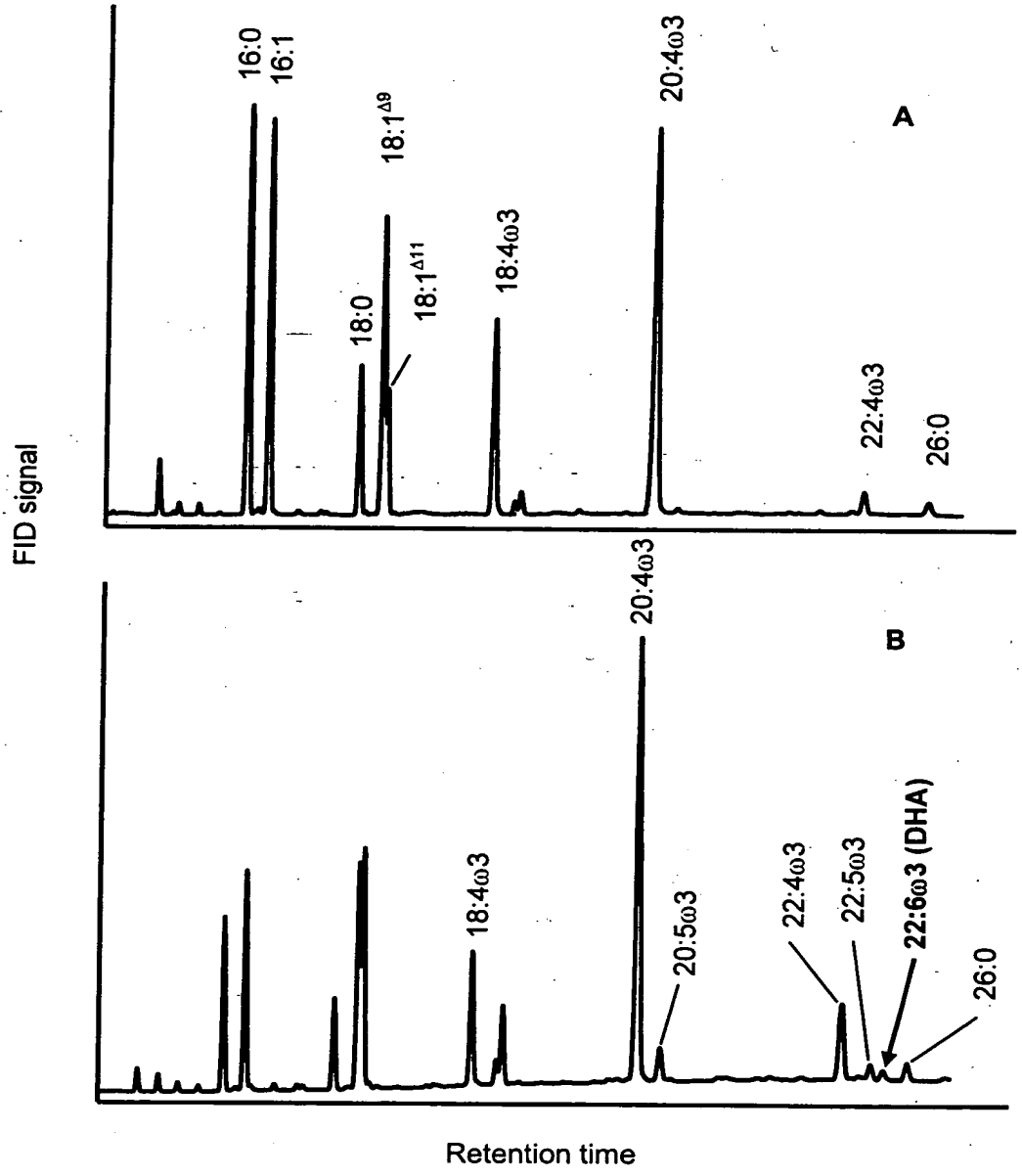


Figure 5: Fatty acid composition (in mol%) transgenic yeasts which had been transformed with the vectors pYes3-OmELO3/pYes2-EgD4 or pYes3-OmELO3/pYes2-EgD4+pESCLeu-PtD5. The yeast cells were grown in minimal medium with tryptophan and uracil / and leucin in the presence of 250 µM $20:5^{\Delta5,8,11,14,17}$ and $18:4^{\Delta6,9,12,15}$, respectively. The fatty acid methyl esters were obtained from cell sediments by acid methanolysis and analyzed via GLC. Each value represents the mean value (n=4) ± standard deviation.

	pYes3-OmELO/pYes2-EgD4	pYes3-OmELO/pYes2-EgD4 EgD4 + pESCLeu-PtD5
Fatty acids	Feeding with $20:5^{\Delta5,8,11,14,17}$	Feeding with $18:4^{\Delta6,9,12,15}$
16:0	9.35 ± 1.61	7.35 ± 1.37
$16:1^{\Delta9}$	14.70 ± 2.72	10.02 ± 1.81
18:0	5.11 ± 1.09	4.27 ± 1.21
$18:1^{\Delta9}$	19.49 ± 3.01	10.81 ± 1.95
$18:1^{\Delta11}$	**18.93 ± 2.71**	**11.61 ± 1.48**
$18:4^{\Delta6,9,12,15}$	**-**	**7.79 ± 1.29**
$20:1^{\Delta11}$	**3.24 ± 0.41**	**1.56 ± 0.23**
$20:1^{\Delta13}$	**11.13± 2.07**	**4.40 ± 0.78**
$20:4^{\Delta8,11,14,17}$	**-**	**30.05 ± 3.16**
$20:5^{\Delta5,8,11,14,17}$	**6.91± 1.10**	**3.72 ± 0.59**
$22:4^{\Delta10,13,16,17}$	**-**	**5.71 ± 1.30**
$22:5^{\Delta7,10,13,16,19}$	**8.77 ± 1.32**	**1.10 ± 0.27**
$22:6^{\Delta4,7,10,13,16,19}$	**2.73 ± 0.39**	**0.58 ± 0.10**

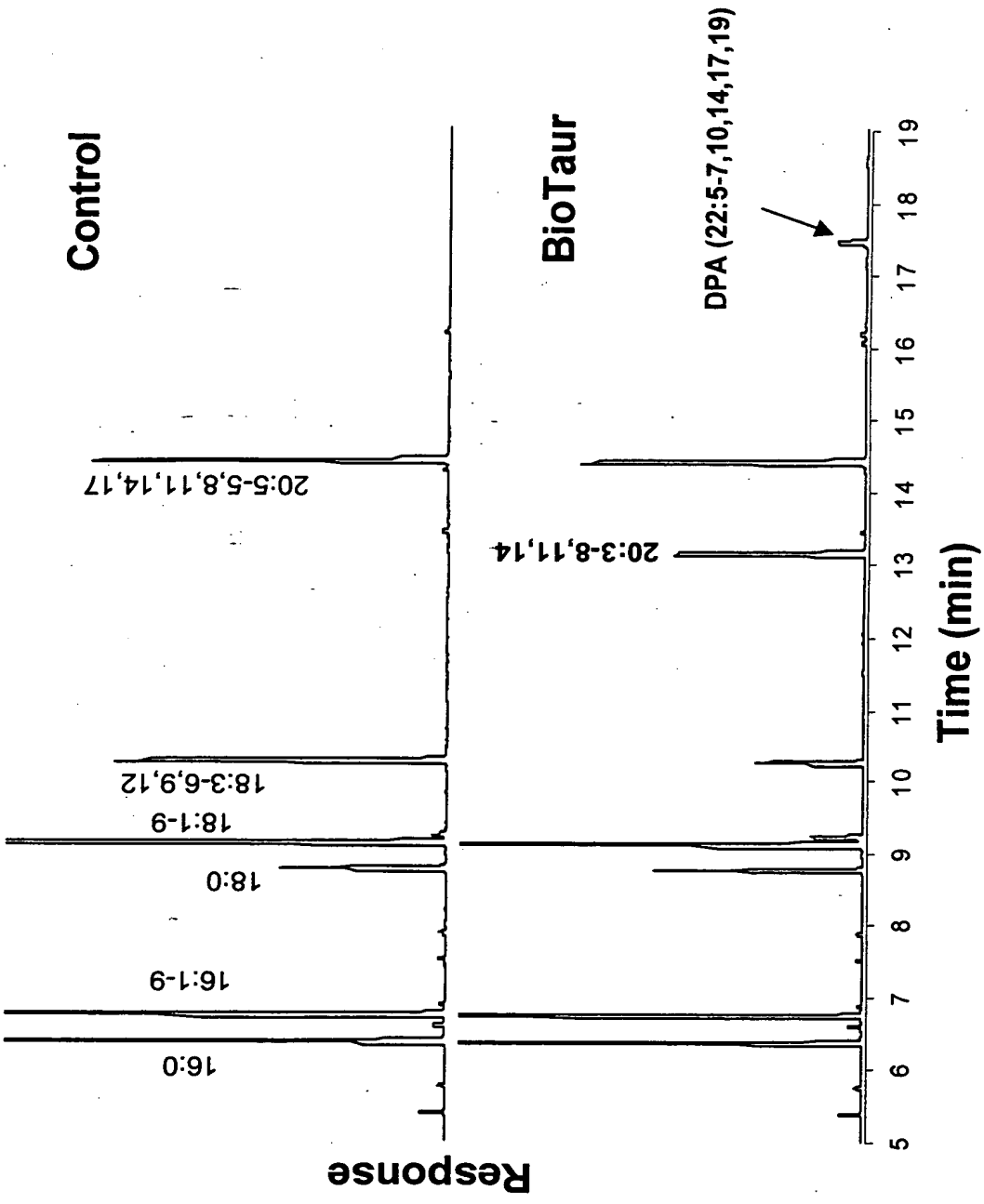


Figure 6: Feeding experiment for determining the functionality and substrate specificity with yeast strains

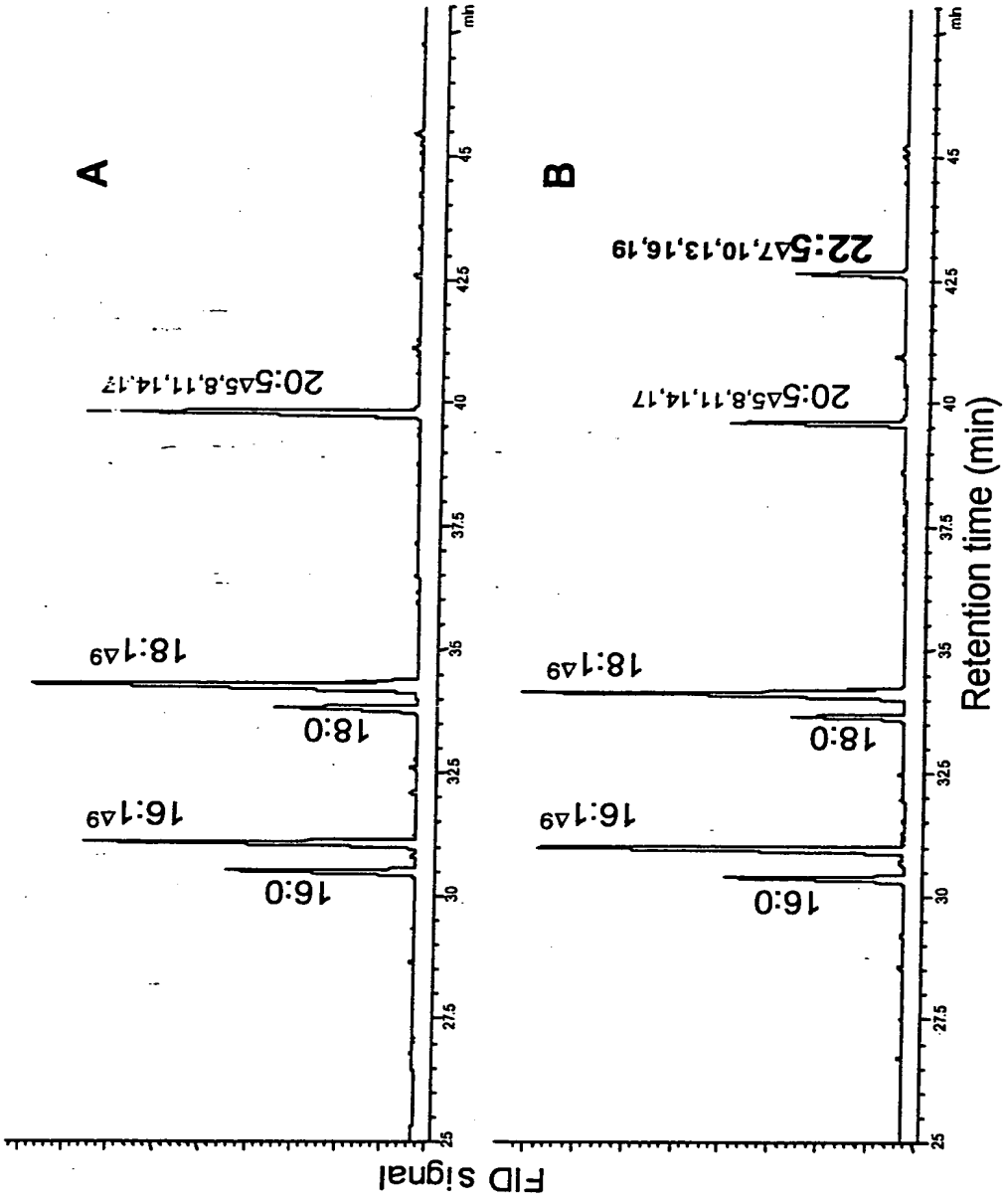


Figure 7: Elongation of eicosapentaenoic acid by OtElo1

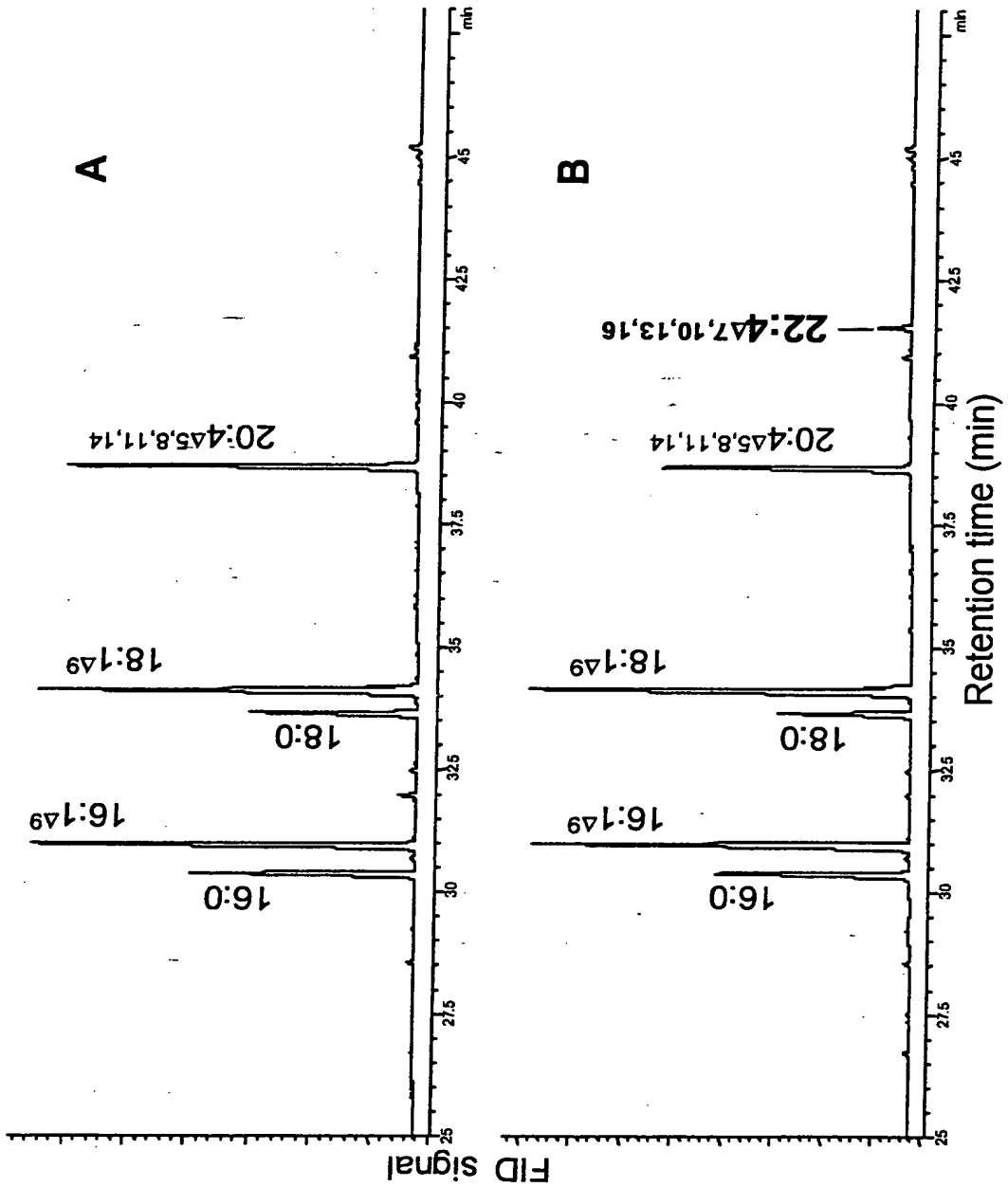


Figure 8: Elongation of arachidonic acid by OtElo1

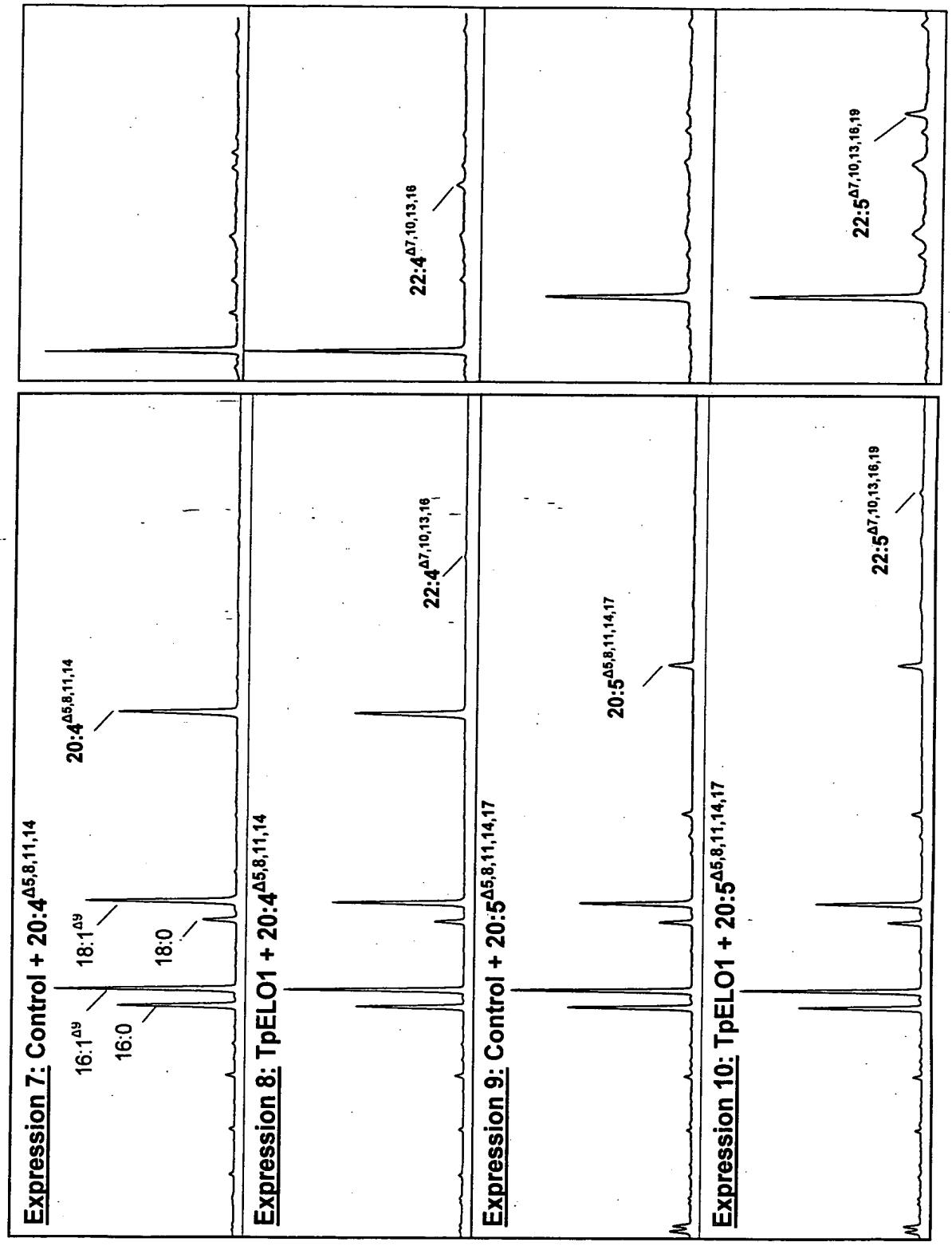


Figure 9: Expression of TpELO1 in yeast

Figure 10: Expression of TpELO3 in yeast

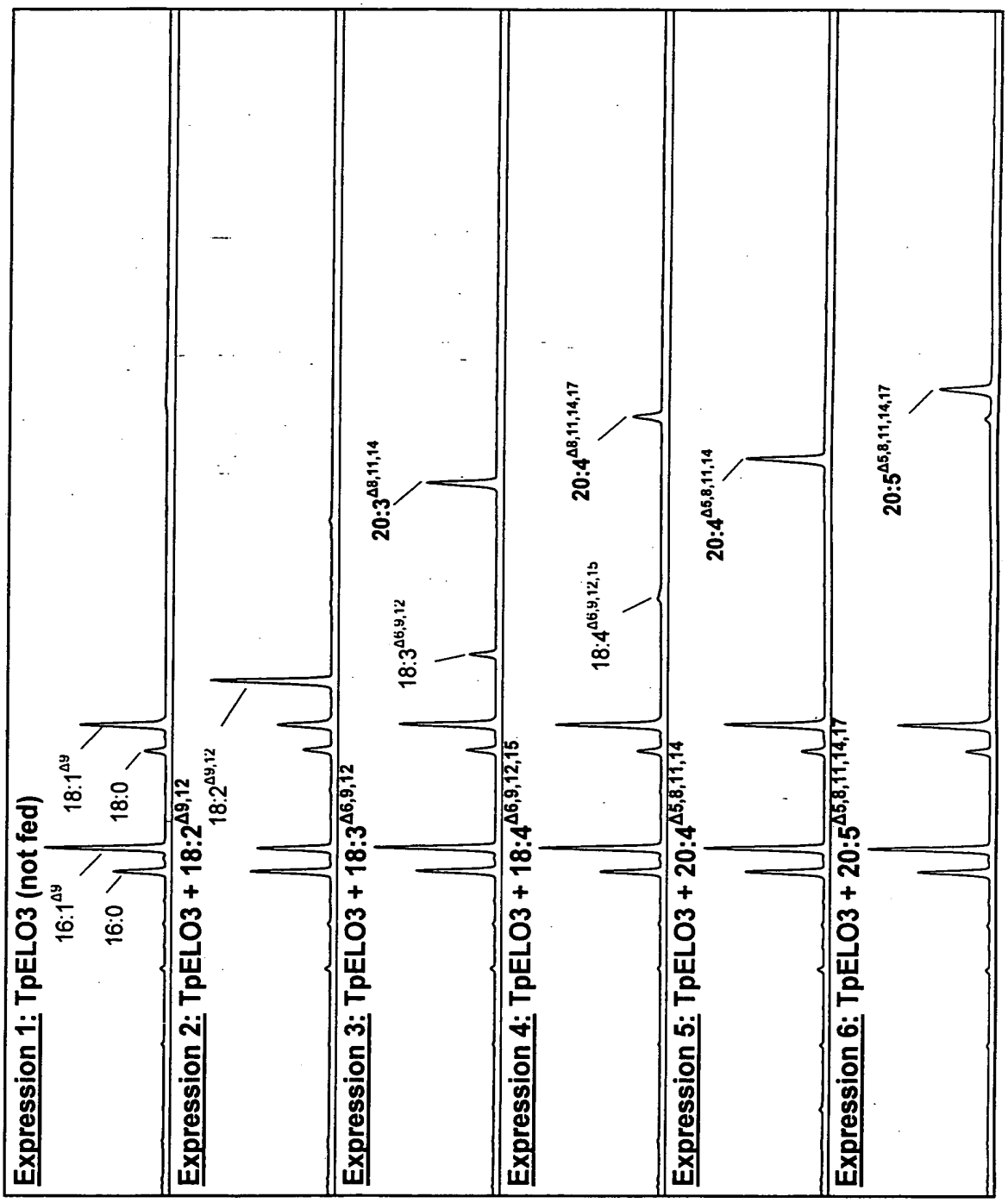


Figure 11: Expression of Thraustochytrium Δ5-elongase TL16/pYES2.1 in yeast

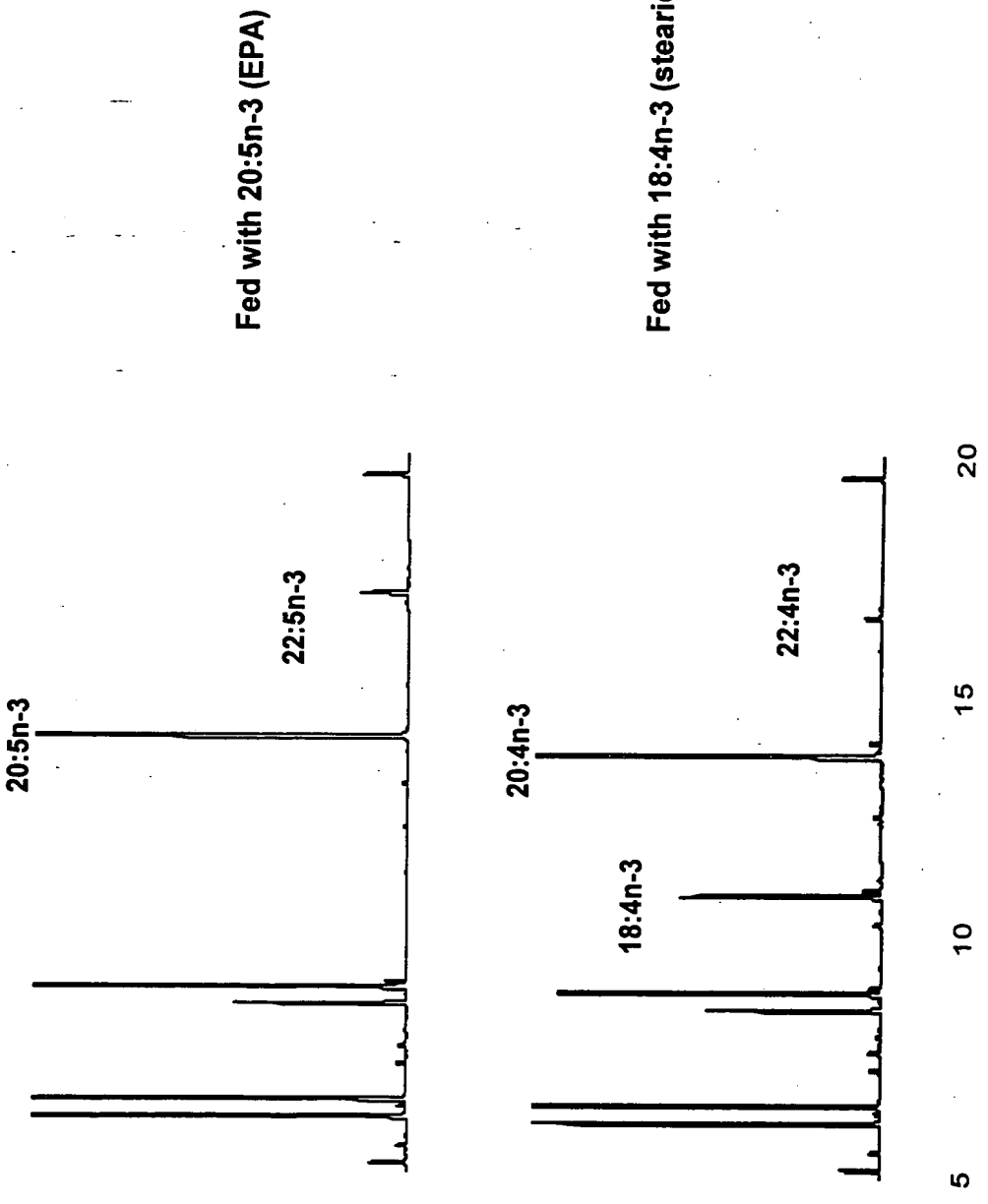


Figure 12: Desaturation of linoleic acid (18:2 ω6-fatty acid) to give α-linolenic acid (18:3 ω3-fatty acid) by Pi-omega3Des.

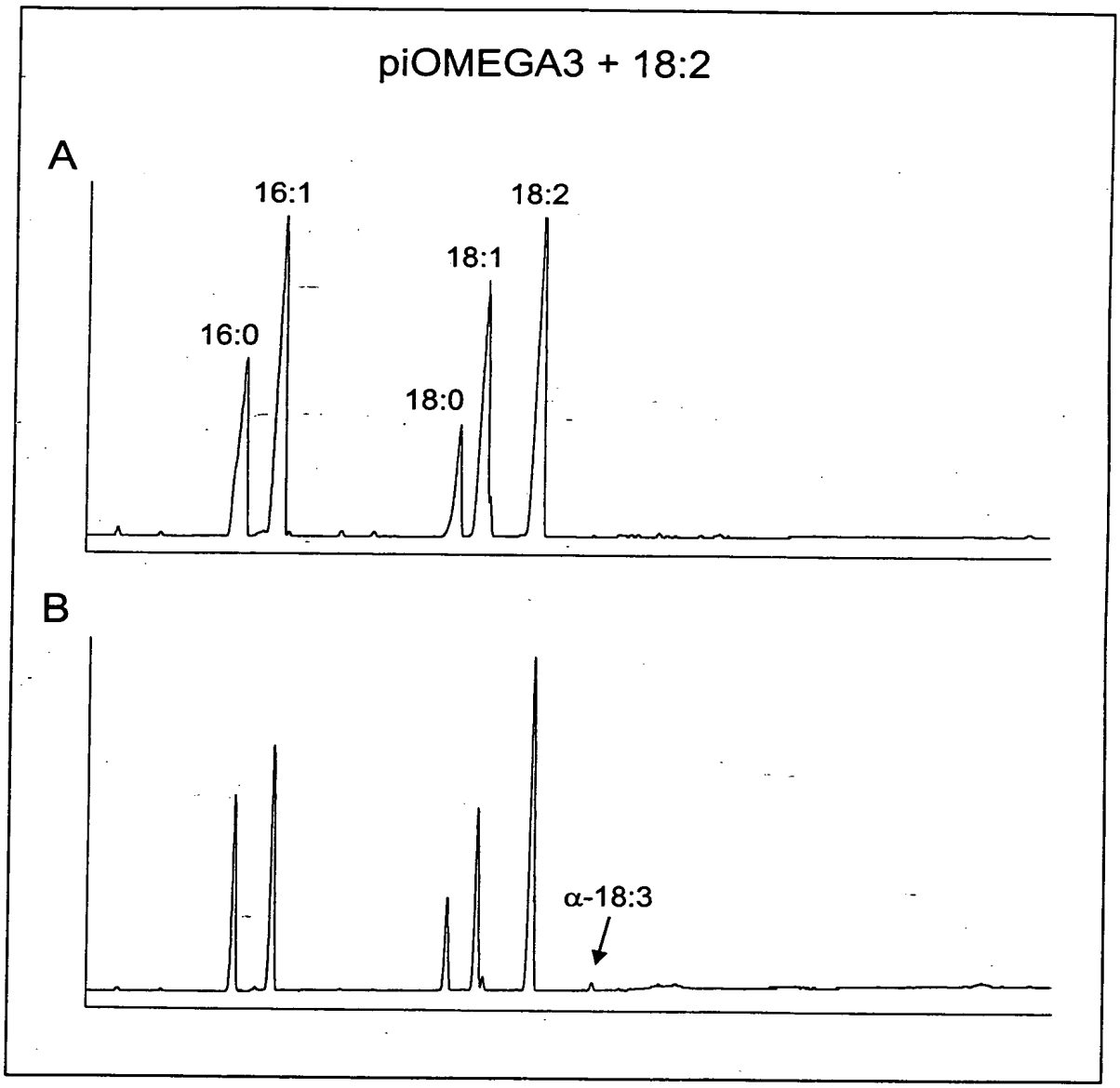


Figure 13: Desaturation of γ-linolenic acid (18:3 ω6-fatty acid) to give stearidonic acid (18:4 ω3 fatty acid) by Pi-omega3Des.

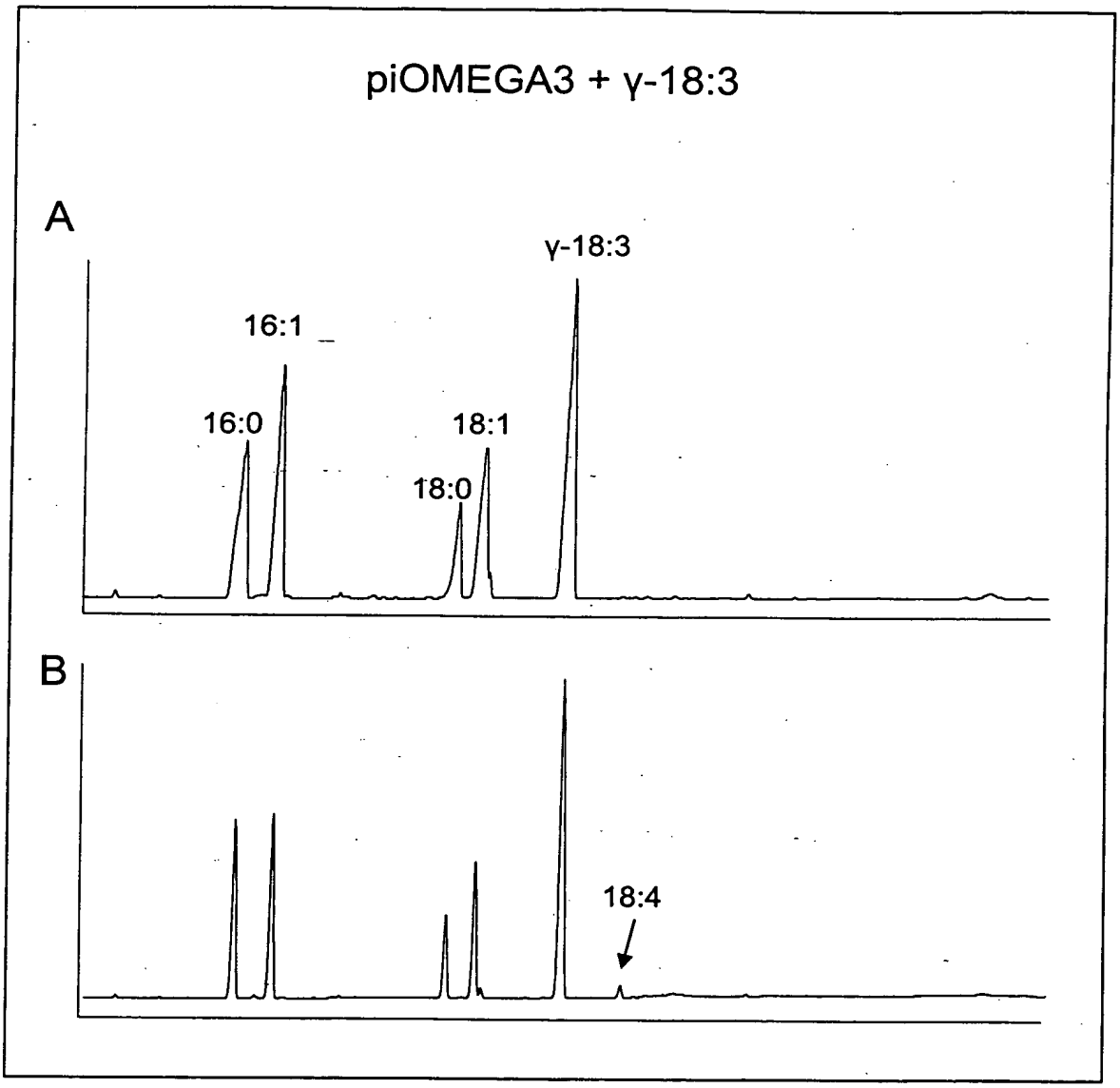


Figure 14: Desaturation of C20:2 ω6-fatty acid to give C20:3 ω3-fatty acid by Pi-omega3Des.

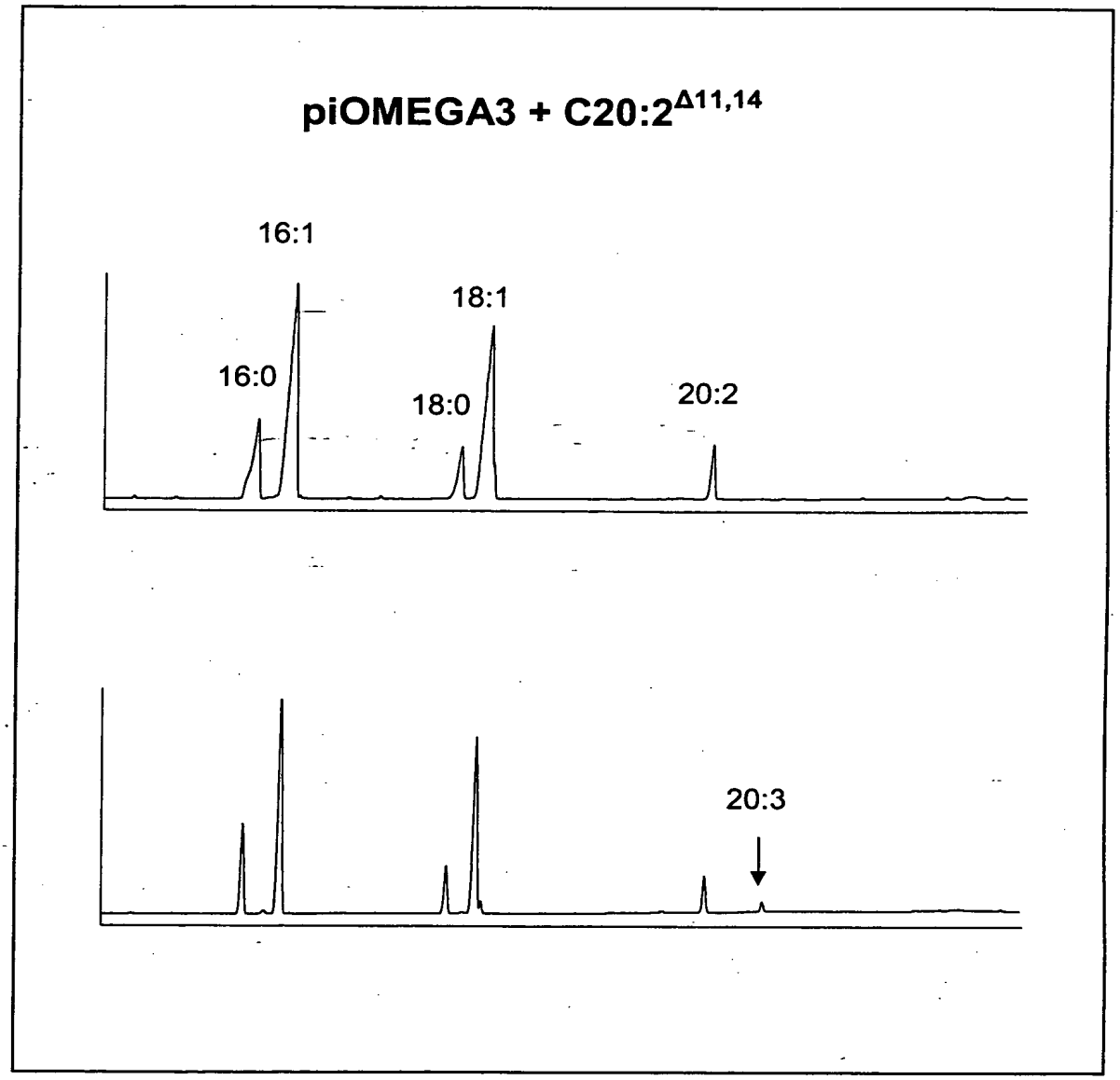


Figure15: Desaturation of C20:3 ω6-fatty acid to give C20:4 ω3-fatty acid by Pi-omega3Des.

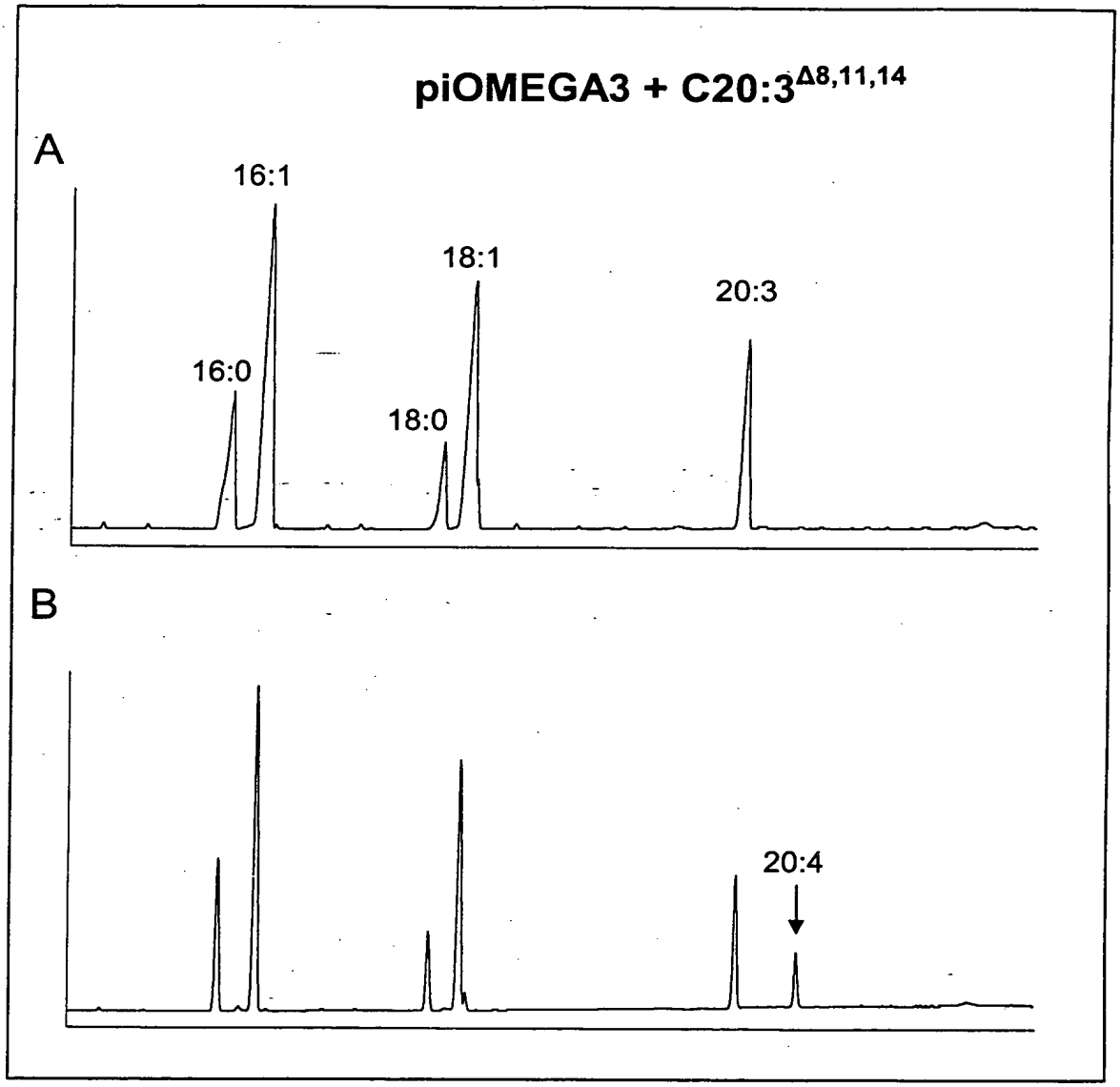


Figure16: Desaturation of arachidonic acid (C20:4 ω6-fatty acid) to give eicosapentaenoic acid (C20:5 ω3-fatty acid) by Pi-omega3Des.

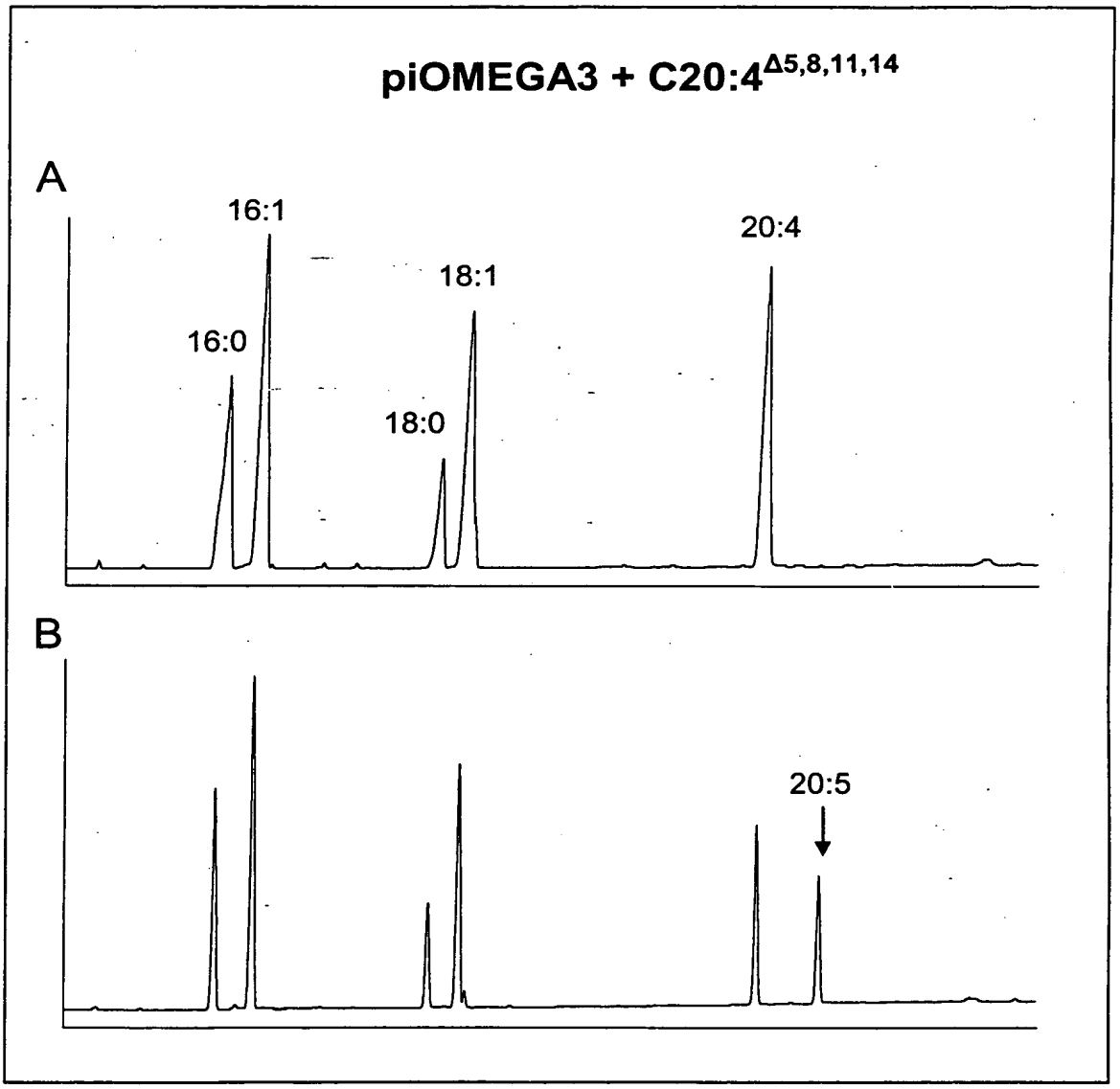
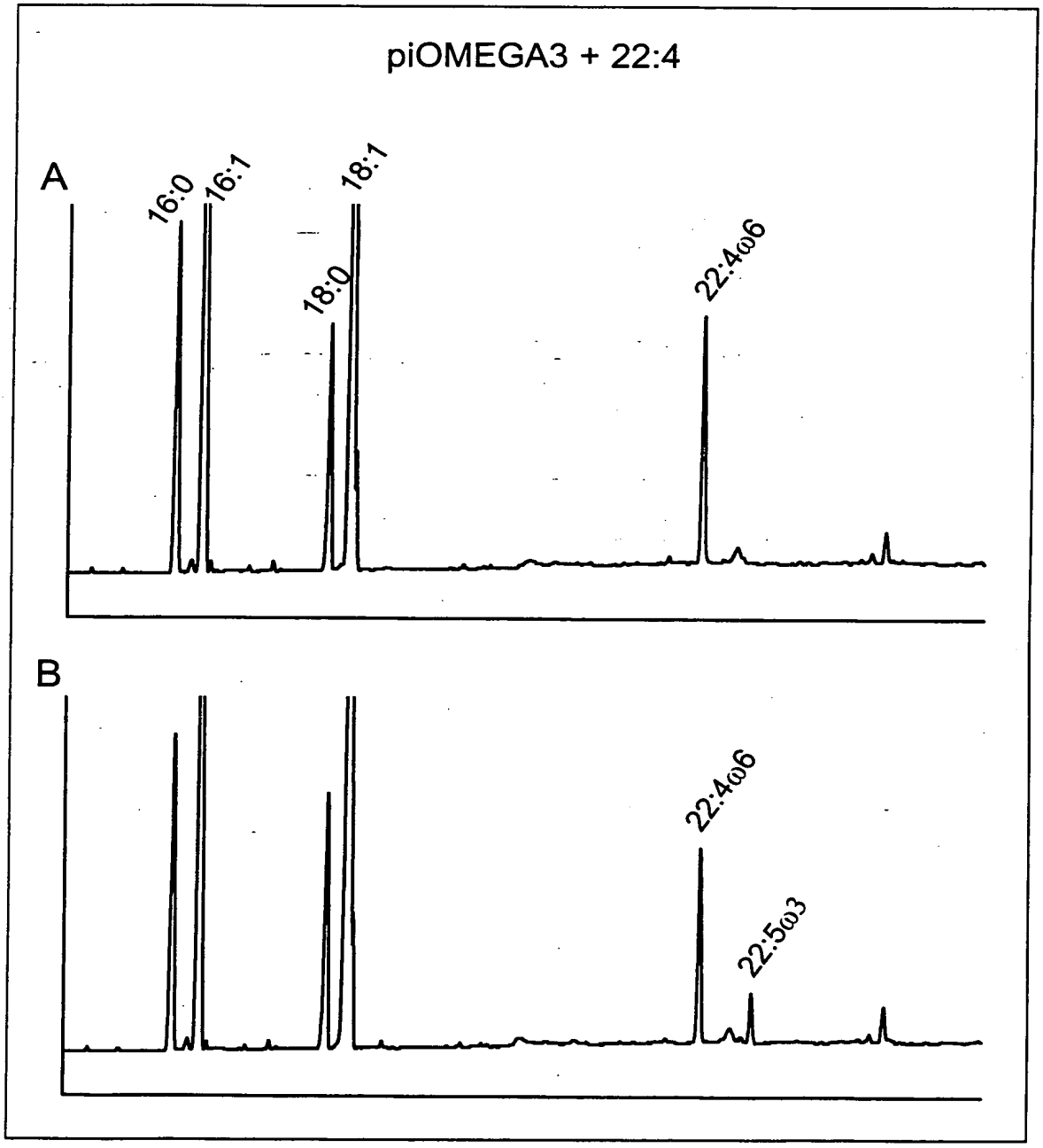


Figure 17: Desaturation of docosatetraenoic acid (C22:4 ω6-fatty acid) to give docosapentaenoic acid (C22:5 ω3-fatty acid) by Pi-omega3Des.



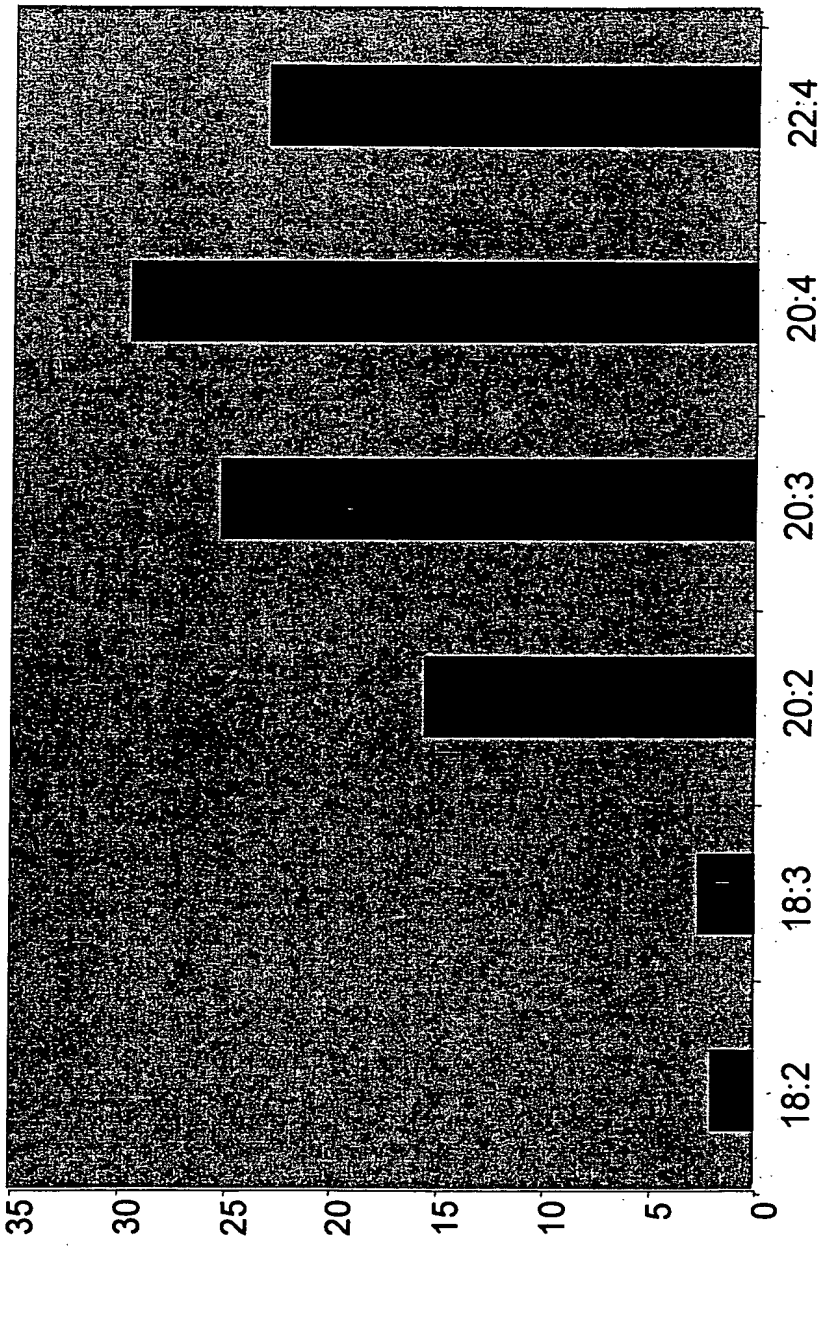


Figure 18: Substrate specificity of Pi-omega3Des for various fatty acids

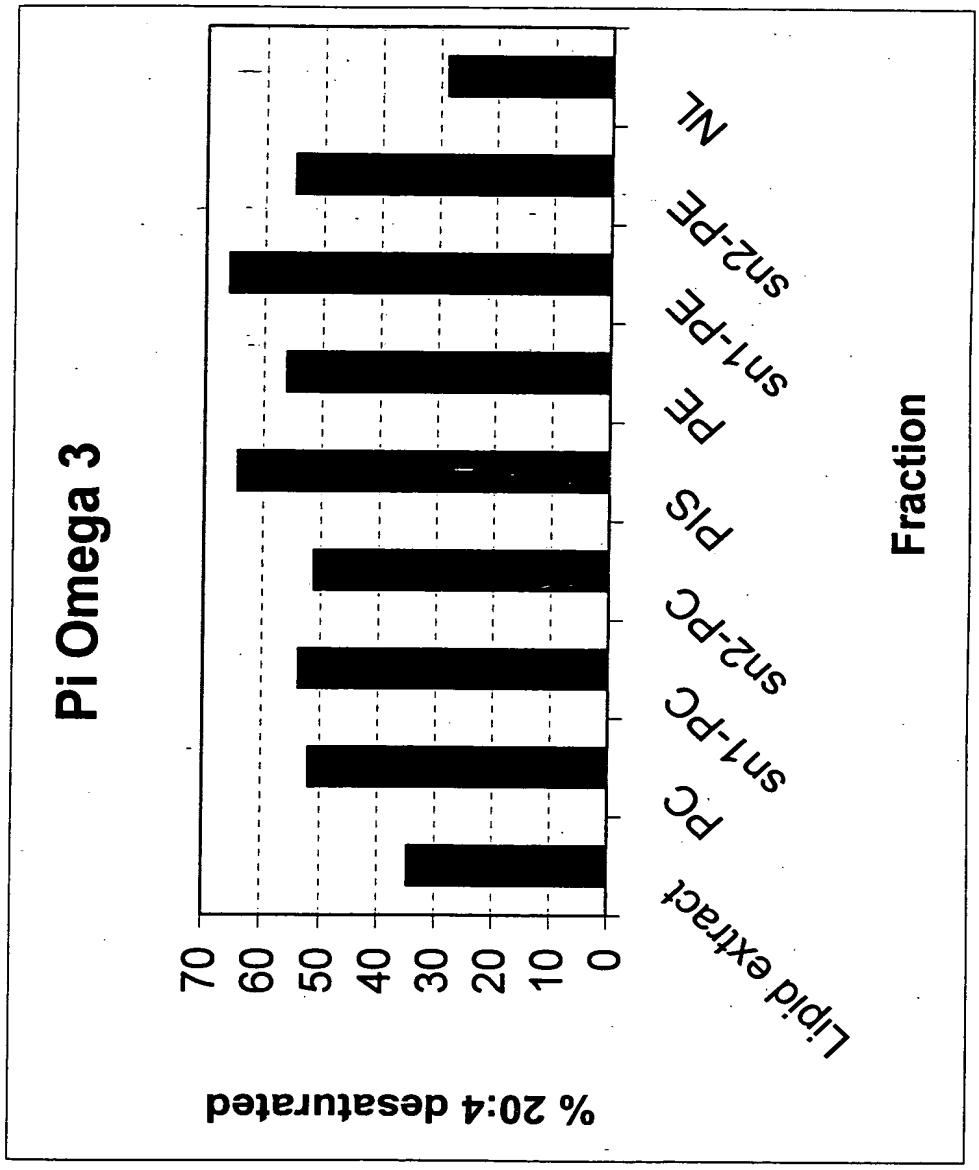


Figure 19: Desaturaturation of phospholipid-bound arachidonic acid to EPA by Pi-Omega3Des

Figure 20: Conversion by OtDes6.1 of linoleic acid (arrow) into γ-linolenic acid (γ-18:3).

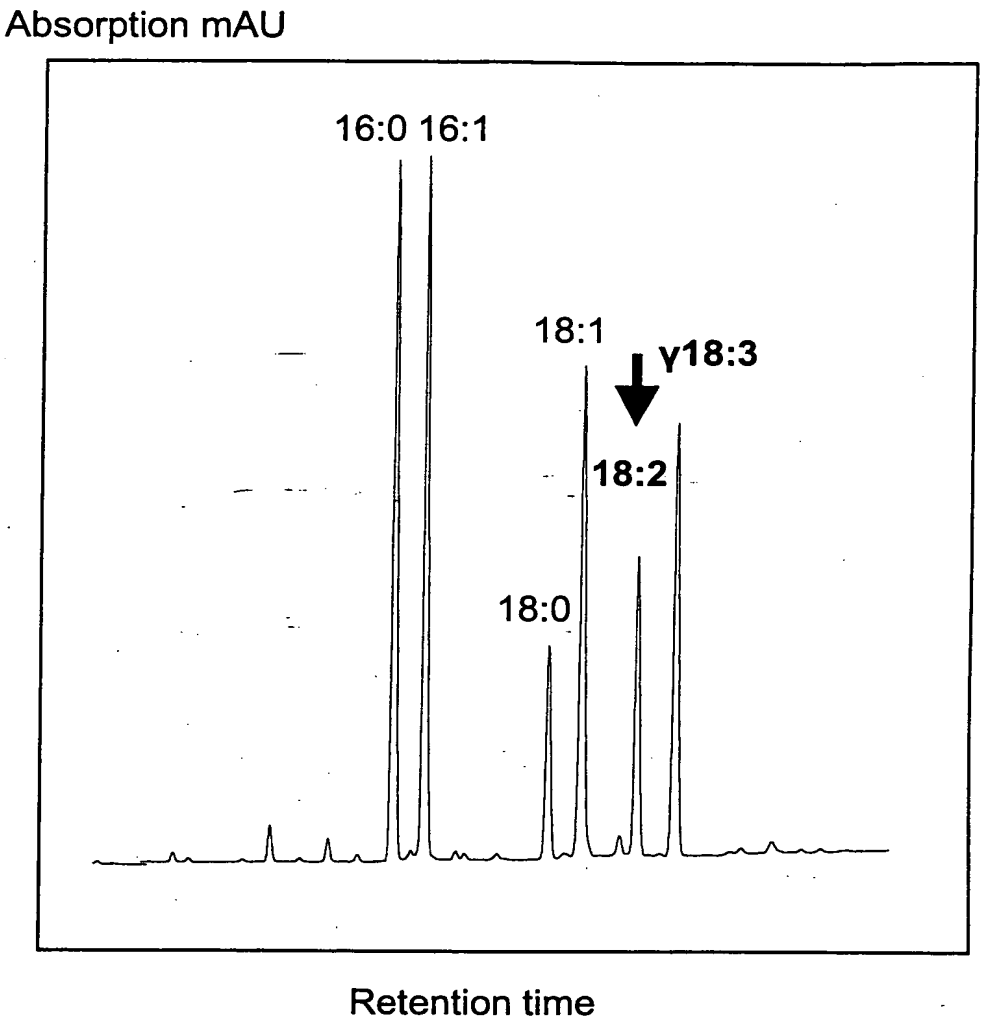


Figure 21: Conversion of linoleic acid and Umsetzung von Linolsäure und α-lLinolenic acidsäure (A aund C), and sowie
rReconstitution of the ARA and EPA synthetic pathways, respectively, in yeast (B and D) in the presence of OtD6.1.

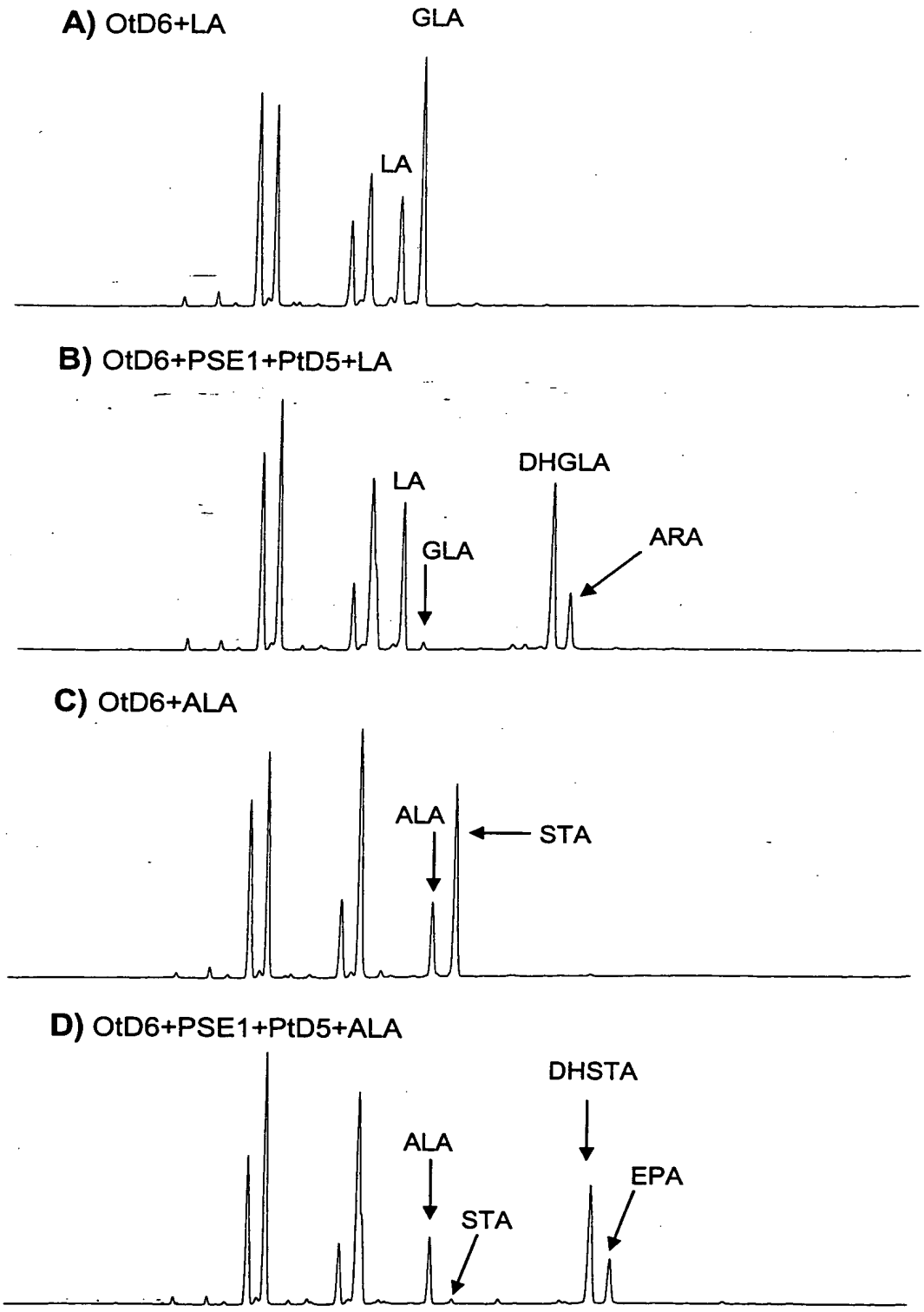


Figure 22: Expression of ELO(XI) in yeast

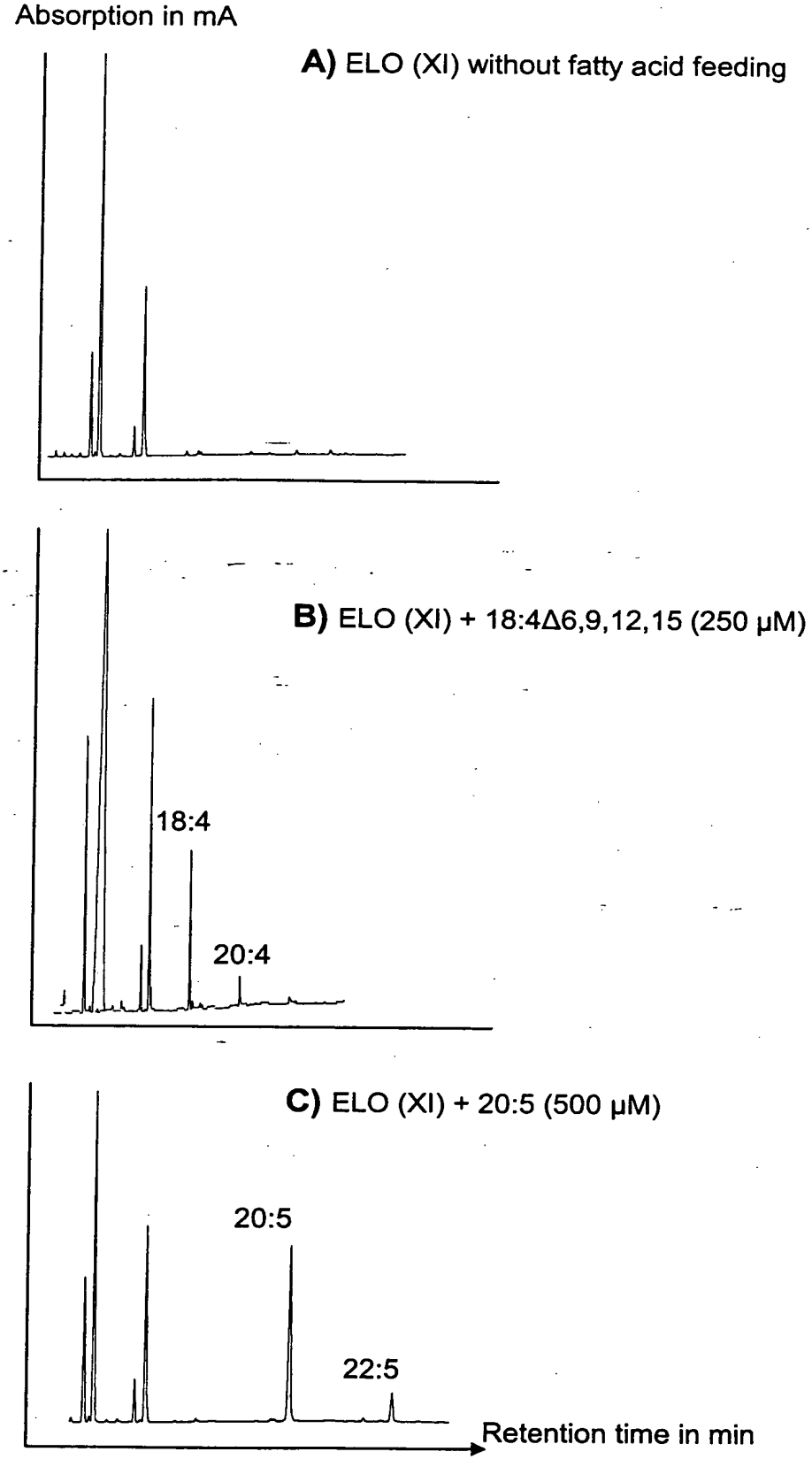


Figure 23:

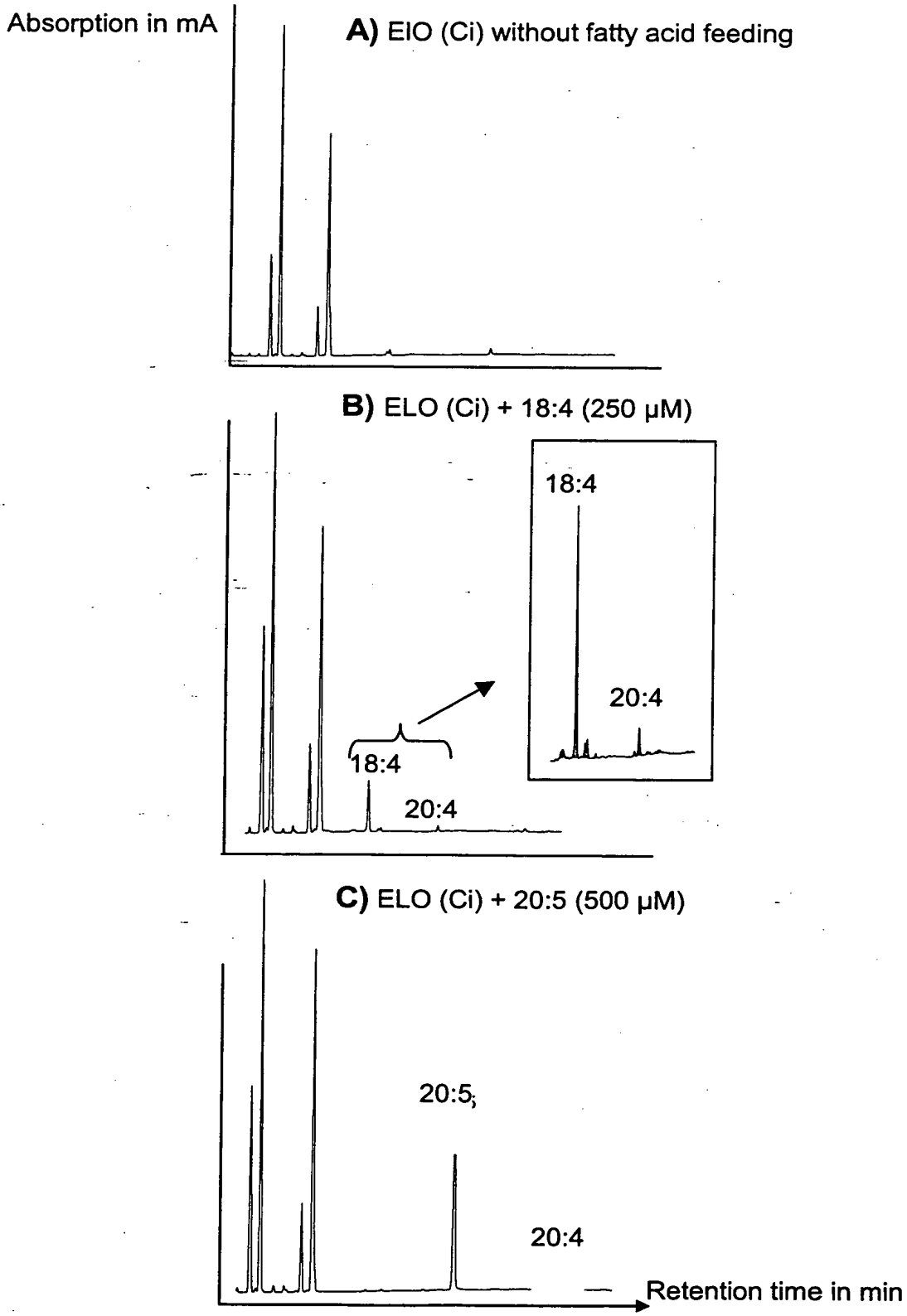
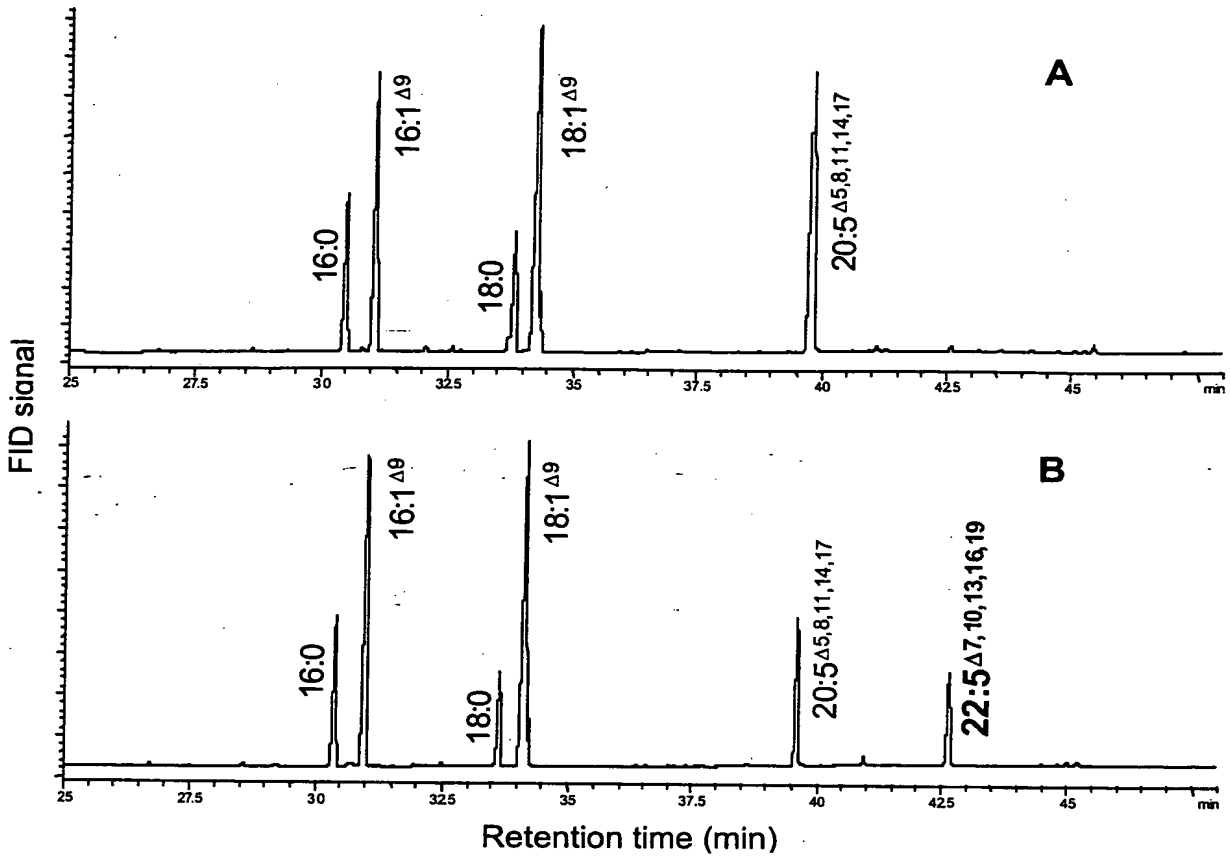

Absorption in mA
A) EIO (Ci) without fatty acid feeding
B) ELO (Ci) + 18:4 (250 µM)
18:4
20:4
18:4
20:4
C) ELO (Ci) + 20:5 (500 µM)
20:5
20:4
Retention time in min

Figure 24: Elongation of eicosapentaenoic acid by OtElo1 (B) and OtElo1.2 (D), respectively. The controls (A, C) do not show the elongation product (22:5ω3).



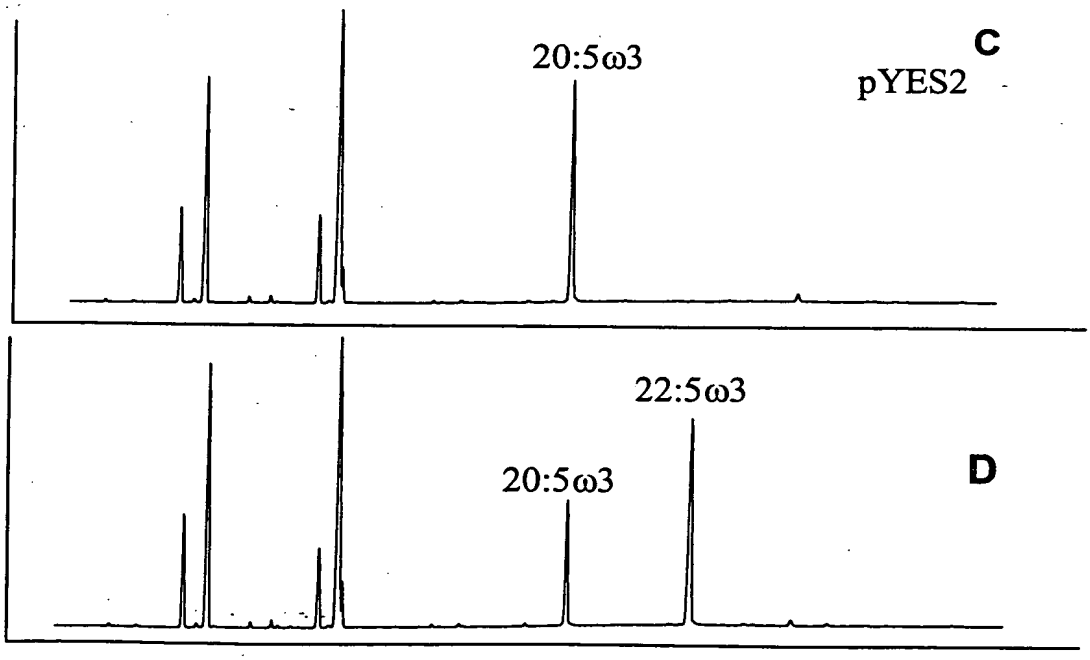


Figure 25: Elongation of arachidonic acid by OtElo1 (B) and OtElo1.2 (D), respectively. The controls (A, C) do not show the elongation product (22:4ω6).

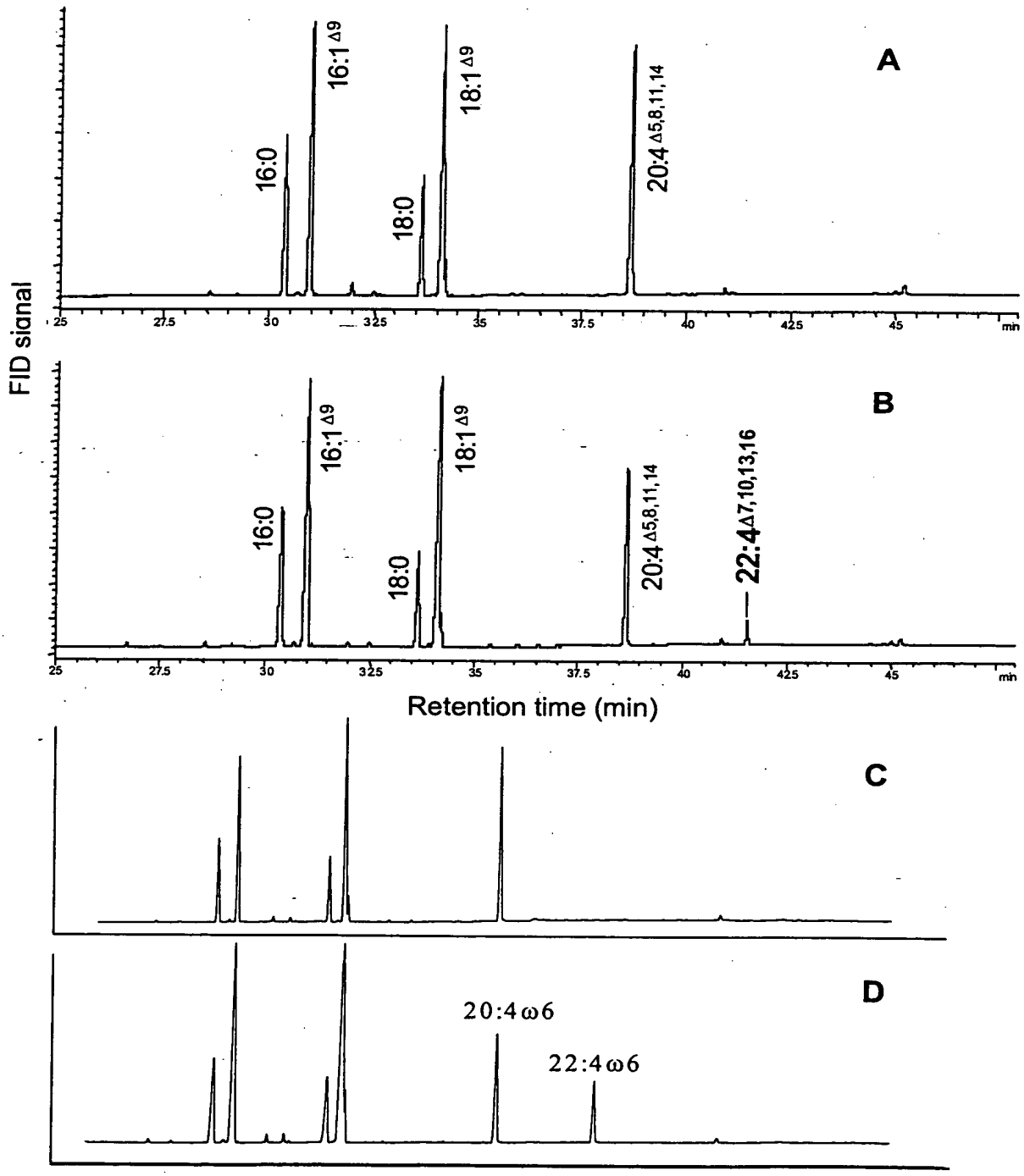


Figure 26: Elongation of 20:5n-3 by the elongases At3g06470.

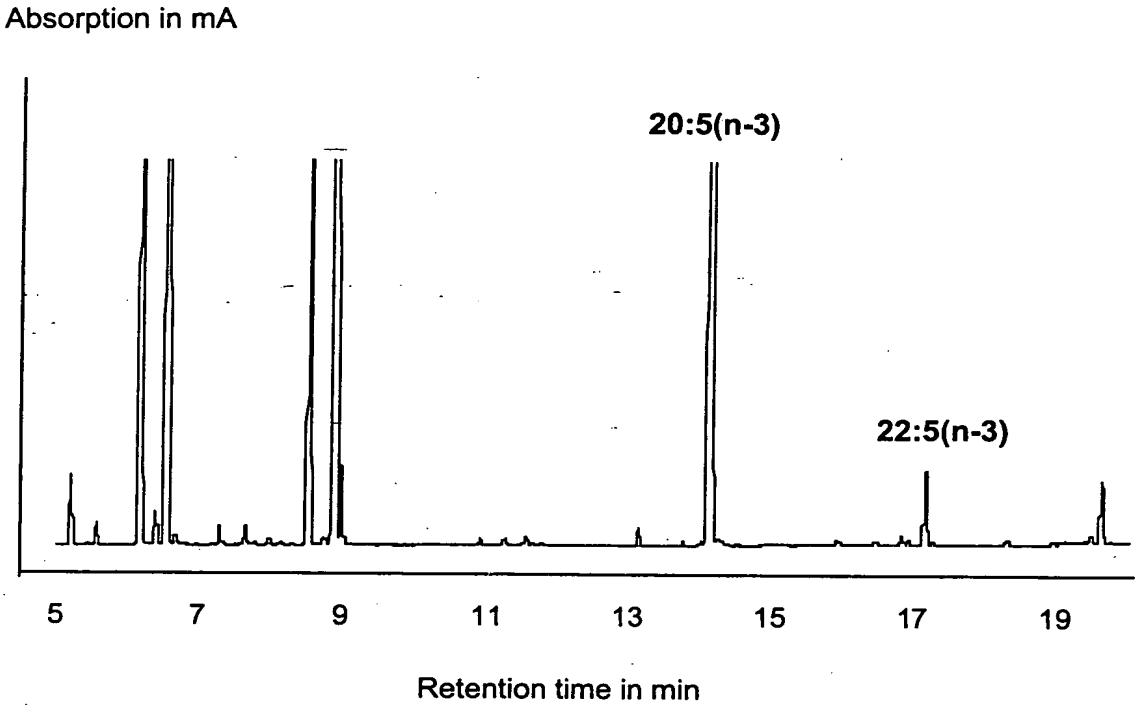


Figure 27: Substrate specificity of the Xenopus Elongase (A), the Ciona Elongase (B) and the Oncorhynchus Elongase (C)

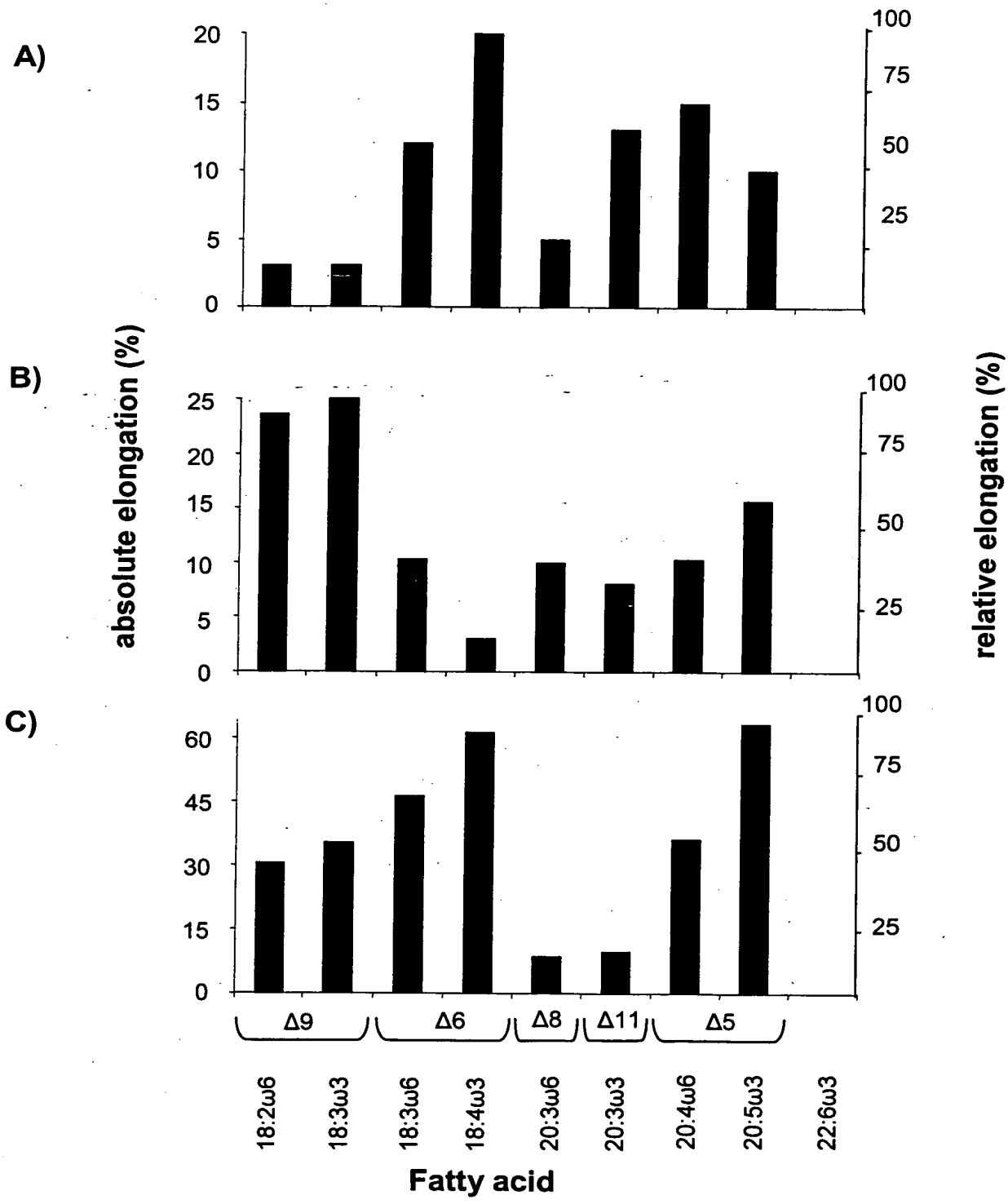


Figure 28: Substrate specificity of the Ostreococcus Δ5-elongase (A), the Ostreococcus Δ6-elongase (B), the Thalassiosira Δ5-elongase (C) and Thalassiosira Ostreococcus Δ6-elongase (D)

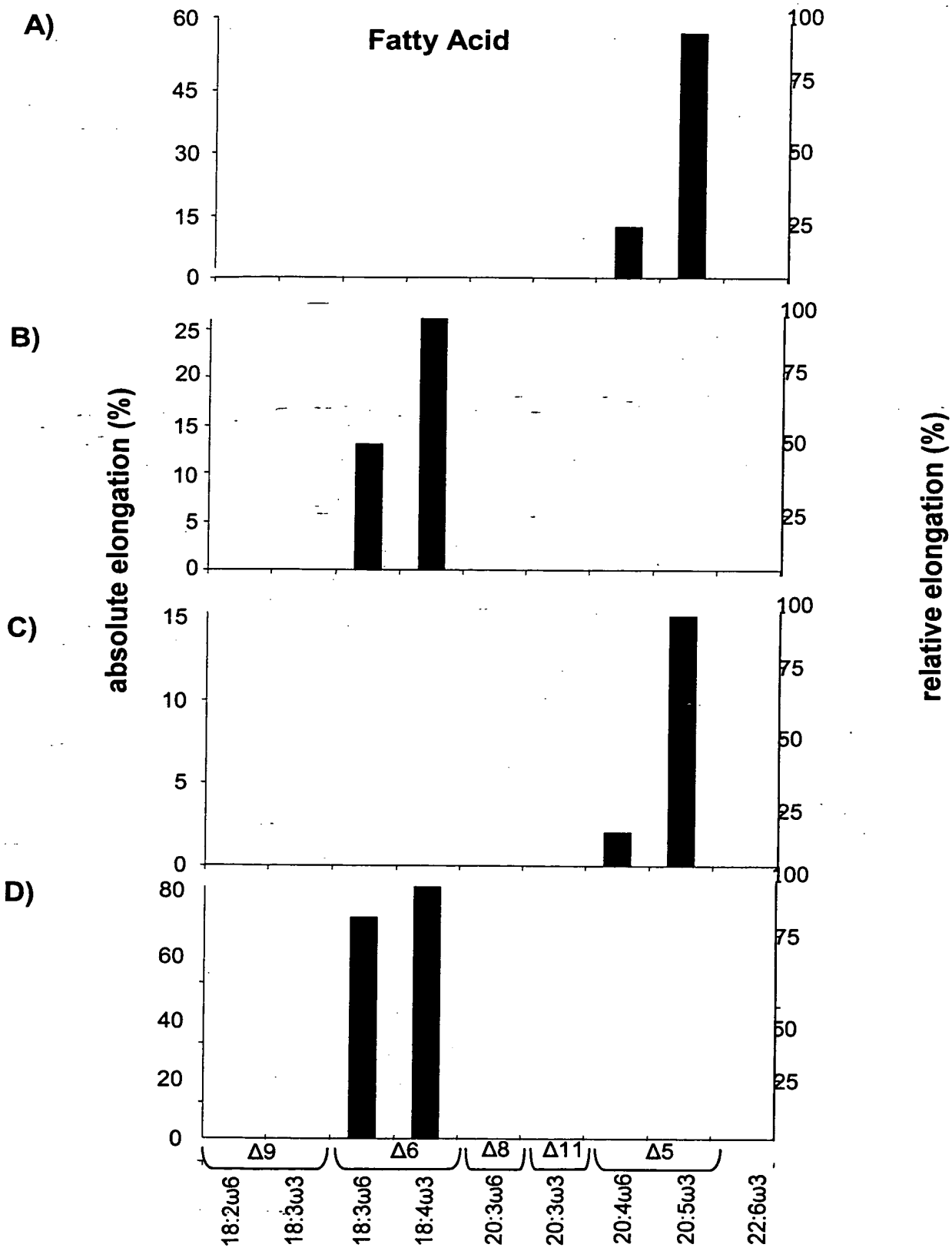


Figure 29: Expression of the Phaeodactylum tricornutum Δ6-elongase (PtELO6) in yeast. A) shows the elongation of the C18:3$^{\Delta6,9,12}$-fatty acid and B) the elongation of the C18:4$^{\Delta6,9,12,15}$-fatty acid

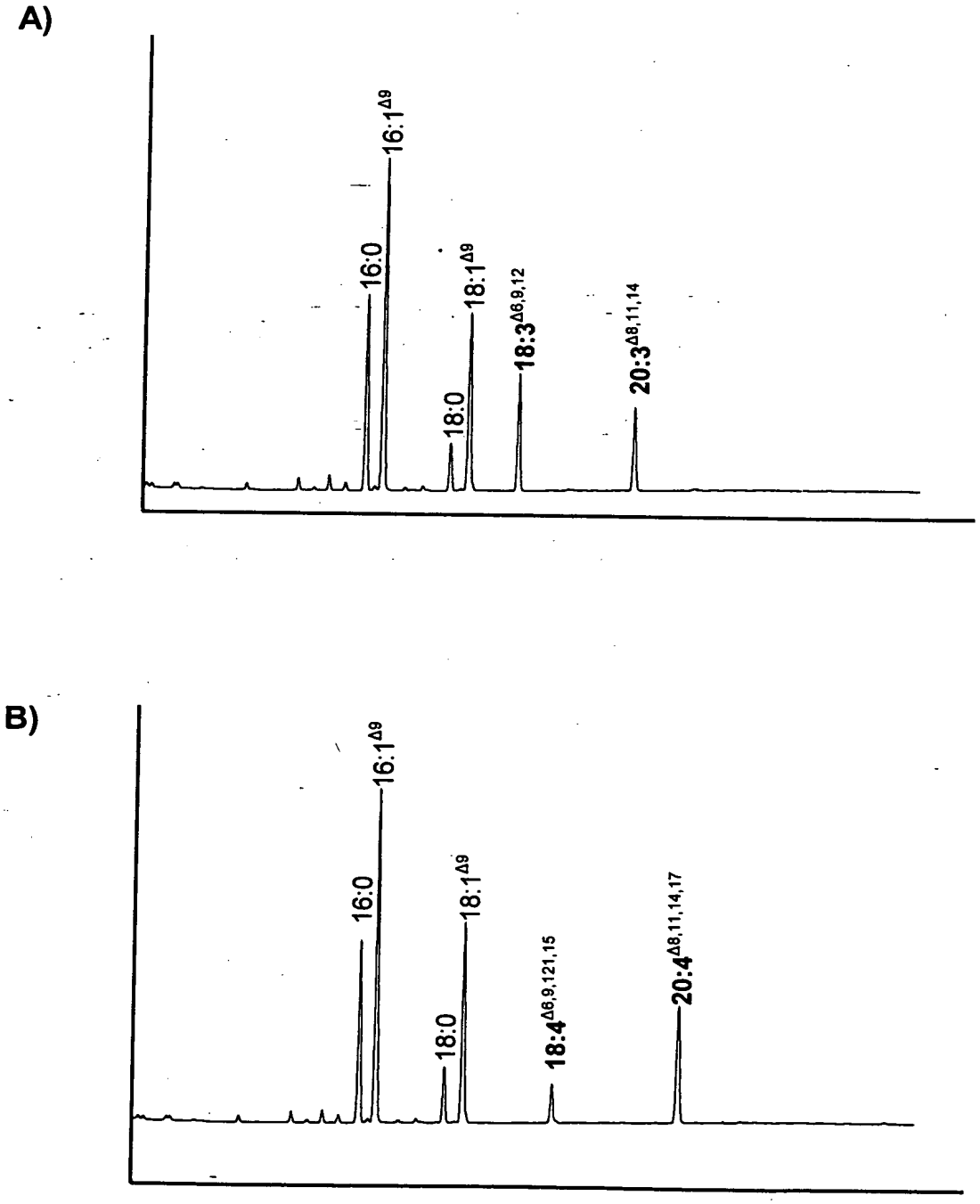


Figure 30: Figure 30 shows the substrate specificity of PtELO6 with regard to the substrates fed